DOCUMENT RESUME

ED 213 528 PS 012 730

AUTHOR Reifel, Stuart
TITLE Age Differences in Symbolic Representation: Fluidity in Representational Construction.
PUB DATE Aug 81
NOTE 24p.; Paper presented at the Biennial Meeting of the International Society for the Study of Behavioral Development (Toronto, Ontario, Canada, August 17-21, 1981).

EDRS PRICE MF01/PC01 Plus Postage.
DESCRIPTORS *Age Differences; *Constructed Response; *Elementary School Students; *Goal Orientation; *Performance Factors; *Preschool Children; Preschool Education; Primary Education; Sex Differences
IDENTIFIERS Blocks; *Symbolic Representation

ABSTRACT

This paper reports a cross-sectional, developmental study of the fluidity of children's mental functioning (representational skills) in contexts involving the representational use of blocks. Data were collected from a sample of 40 children from a laboratory school: 20 four-year-olds and 20 seven-year-olds, with an equal number of boys and girls in each group. Each child was taken to an experimental room and was invited to play with a set of table-top building blocks while answering questions about prior experience with block play. After returning the blocks to their box, the child was directed to listen closely to the story of "Little Red Cap." Subsequently, the child was told to use the blocks to represent the story. Children's block construction behavior was videotaped. Upon completion of the construction task, the child was asked to describe in detail what the blocks showed. The children's descriptions were recorded and photos of all block representations were taken. If the judges determined that the first-placed block appeared to be reoriented in space in the course of construction, they categorized the child as "fluid." Initial analyses indicated that four-year-olds' constructions were more frequently "fluid" than were seven-year-olds' constructions. Among four-year-olds only, sex differences were found. Boys' constructions were more fluid than girls'. Post hoc analysis revealed that most reorientations or fluid constructions were due to blocks falling. Results are discussed. (Author/RH)

Age Differences in Symbolic Representation: Fluidity in Representational Construction

by

Stuart Reifel

Department of Curriculum and Instruction
The University of Texas at Austin

Paper presented at the biennial meeting of the International Society for the study of Behavioral Development, Toronto, August, 1981.

Age Differences in Symbolic Representation:
Fluidity in Representational Construction

During early childhood we make great leaps in the ability to form and to use symbols (Piaget, 1962; Werner & Kaplan, 1963). Symbolic representation involves relationships between a signifier (i.e., language, gesture, painting, sculpture) and the signified (i.e., some referent, or that which is being represented). A person creates a symbol by giving form, through the use of any number of media, to a referent.

Earlier research has documented the child's increasing ability to represent a complex referent (a story) with representational materials such as language (Brown, 1977; Brown and Smiley, 1975) and building blocks (Reifel, 1981). Other research has documented the increasing ability to use more complex structures in the course of representing models (Greenfield, 1978) and in symbolic representations (Reifel & Greenfield, 1981). For representational constructions, both a conception of the referent and the structural use of materials develop with increasing age, refelcting increasing differentiation and hierarchic integretion of mental abilities (Werner, 1957) and structures (Piaget, 1971).

There is value in looking at symbolic representational skills in a variety of representational media. There is a likelihood that humans have different skills with different media, such as prose, paint, poetry, and so on. There is also the possibility that some media allow certain ideas to be expressed, while other media do not (Langer, 1942). Some have argued for the need to explore human abilities in all symbolic media as

a way of refining our knowledge of cognition (Gardner, 1979). Developmentally, we must become more aware of the significance of different media for subsequent competence, even competences in non-related areas of human growth. In this paper, I focus on building blocks, on bricks, a representational material that is commonly used by young children in many parts of the world.

Since the construction of symbolic representations requires skilled manipulative action (at least in the case of building blocks [Bruner, 1972]), it is pertinent to view the use of blocks as a representational tool. They are a material that function instrumentally in symbolic representation; their use as a tool is critical for the structuring of whatever referential cognition a child might be wishing to indicate.

From Werner's (1957) perspective; one aspect of mental development in early childhood is fluidity in mental functioning. Fluidity refers to the child's inability to maintain goal-oriented behavior or mental functioning. Younger children (to about age 6) are more likely to manifest changes in their constructive purposes over the time of construction. The organization of play materials (such as block play and drawing) are expected to change in the course of a play session (Werner, 1957, p. 128).

The purpose of this paper is to present data on fluidity in representational construction. Findings will focus on age and sex differences in the representational use of blocks. Younger children are expected to be fluid in their mental functioning (i.e., representational skills); they change their goals and actions which they interact with the materials. Older children are expected not to be fluid; they should set a goal and pursue it. Since we will be viewing cases of symbolic representations,

we would expect younger children's use of the symbolic medium to transform in the course of representation, whereas older children's mental plan (i.e., goal) for representation will be immediately pursued to completion.

Methodology

Data for this cross-sectional developmental study were collected from a sample of 40 children from a laboratory school. There were 20 four-year-olds and 20 seven-year-olds, with an equal number of boys and girls in each age group. Various ethnic groups were represented in the stratified random sample. Many of the children's parents are professionals, but some of the school population is on scholarship, indicating some socio-economic diversity in the population. All children came from homes where English is the spoken language.

Each child was taken to an experimental room where the following equipment was arranged: a table and chairs for the child and the experimentor, a box of table-top building blocks on the table, a video-recorder (focused on the table), a tape-recorder, and various recording forms. A female research assistant sat across the room to record child speech and reactions.

The child was invited to play with the blocks while answering questions about prior experience with block play. After returning the blocks to the box, the child was directed to listen closely to the story of Little Red Cap (Grimm [1972] version of Little Red Riding Hood). At the end of the story, the child was directed, "Use the blocks to show me the story of Little Red Cap. You can use the blocks any way you like to show me the story we just read." The video-tape recorder was activated, the child

constructed, then the child was asked to describe in detail what the blocks showed. The research assistant recorded the responses. The video-recorder was stopped. After the child was escorted back to the classroom, a set of photos was taken of all block representations.

Two judges compared photos of each child's first block construction on the video-tape (defined form the first placement of a block on the table) to determine if that first attempted construction is present or absent in the photos of the final construction. If the first-placed blocks appear to be reoriented in the course of construction, the judge indicated "Fluid." If the first-placed blocks remain in their original position throughout the construction session (i.e., if they are not relocated), the judge indicated "Not Fluid." Judges agreed on 100% of the cases.

Analysis and Results

Eleven out of twenty of the four-year-olds' constructions (55%) were fluid. Only three out of twenty of the seven-year-olds' constructions (15%) were fluid. Four-year-olds changed the orientation of their blocks during construction more frequently than seven-year-olds did ($X^2 = 8.9$, $p < .01$, df = 1, two-tailed test). Four-year-olds' block representations are more fluid. This is consistent with Werner's theory.

Looking at sex differences within age groups, an interesting difference is found. For four-year-olds only, there is a sex difference. Eighty percent of the younger boys' constructions are fluid, while only 30% of the younger girls' are fluid (Fisher exact p = .03). It appears that the bulk of the age difference reported above can be attributed to the greater fluidity of younger boys. As Table 1 shows, younger girls are not different in fluidity from older girls, and they are not very

different from older boys.

Insert Table 1 about here

A set of illustrations will help clarify the concept of fluidity as operationalized for this analysis. Figure 1 shows the non-fluid construction of a four-year-old boy. (This was not common for younger boys.) The shaded block was the first block placed by the child, and that block was added to continuously to create this final representation of Little Red Cap's house with two chairs inside. Figure 2 shows another four-year-old boy's representation, also a fluid construction. He initially placed the shaded blocks, but his final representation (Little Red Cap's grandmother's house) is not a part of the first-placed blocks. The first-placed blocks are not part of the final representation, at least in the orientation in which they were initially placed.

Insert Figures 1 and 2 about here

Figure 3 shows a (uncommon) four-year-old girl's fluid construction. Again, the shaded blocks are the original configuration, which does not appear in the final representation. (The final representation shows two beds, one for Little Red Cap and one for her grandmother.) There is a marked difference in the child's beginning construction and the final representation.

Insert Figure 3 about here

Figures 4 and 5 are, respectively, a seven-year-old girl's and a seven-year-old boy's representations. Neither construction is fluid; the first-placed block (shaded) shows these children's implementation of the representational goal that began at the first placement of a block. The

girl immediately began building the grandmother's house, then surrounded it with flowers. The boy began with the grandmother's house, then added Little Red Cap's house and the path that connects the two houses.

Insert Figures 4 and 5 about here

In order to understand some of the reasons for these findings, a post hoc analysis was done to ascertain what happened during the process of construction that might lead to constructions totally changing form. A number of reasons for the above findings presented themselves. First, children might change their minds about how they want the blocks placed, so they physically move the blocks to a new orientation on the table. Second, children might not be able to control the materials as they build. They may not understand the physical properties of blocks, so the constructions might fall or crumble before the representation is completed. (There are other possibilities relating to a fluid change of the referent in the child's mind during the time that the child works with the blocks. The method used in this study cannot address this possibility directly. This inquiry was limited in that regard, as discussed below.) Videotapes of the construction sessions were reviewed to see what happened in the course of the session. As it turns out, the two reasons presented above do explain all cases of fluidity in construction as presented in this paper.

The vast majority (79%) of fluid constructions were transformed due to blocks falling. (See Table 2) Children were simply trying to put blocks into configurations that were either physically impossible (e.g., a narrow, tall tower with no side support) or beyond their level of dexterity (e.g., placing blocks so that they would constantly be knocked

by their own hands). Most children who were found to be fluid in their use of blocks simply could not manipulate the material as well as they thought they could. They suffered from a series of construction "accidents" that changed the face of their intended representation.

Insert Table 2 about here

A far smaller number of "fluid" children (21%) changed their minds about what to do with the blocks, removed their first representational efforts, then constructed something entirely new. In one case, I had a strong sense of what the child intended. When a four-year-old girl began with a row of blocks (see Figure 3), she attempted to form a corner but ended up with a semi-circular curve. I felt that she was trying to form a right angle in order to make the corner of a house. The semi-circle displeased her, so she removed that construction and built the two beds. This case is illustrative of the few situations (n = 3) when a child moved blocks to change the representation.

Discussion

It seems clear that there is development from fluidity toward a more controlled, purposeful use of blocks for symbolic representation. Much of this developmental change can be associated with sex differences, and in turn can be viewed as a function of manipulative skill. When younger boys represent with blocks, the configuration of blocks is much more likely to transform during the process of representation. Older children and younger girls do not transform their block configurations as often during representation.

Werner (1957) sees fluidity as a developmental attribute that diminishes as the child is better able to keep a purpose or goal in mind. The

older child is expected to be able to decide on an objective and then to pursue its implementation. The older children in this study appear to have done just that, possibly adding to their goal (e.g., deciding to add flowers and trees to their representation) but not transforming anything that they had initially begun (e.g., not building a house only to change it at a later time).

In this study, a conservative interpretation of fluidity was defined: If the child's first block construction changed its form over the course of the entire construction session, that child's construction was considered fluid. This definition leads to a serious limitation in analysis and for conclusions we can draw about representational construction. We cannot be certain, for example, what each child intended to represent; the children were not asked what they were going to construct; and they were directed only to show the story. We cannot know what the boy who created the construction in Figure 2 intended those tall towers to be; perhaps it was an early attempt at the grandmother's house. The girl's work in Figure 3 is also difficult to interpret; the row of blocks looks more like a wall, suggesting that she did not intend initially to construct two beds.

Neither can we tell if those constructions that are not fluid represent what the child had initially intended, although it seems fairly reasonable to conclude from the direct and obvious meanings of the representations that the children had central aspects of the story fairly well in mind as they set out on their tasks. In order to be more confident about the role of the referent in fluid construction (as opposed primarily to the role of manipulation of the signifying material),

it would be reasonable to question children prior to construction about what they intend to represent with the blocks, or to ask them to talk about what they were constructing while they are putting it together. This would provide a more specific standard against which to measure a resultant construction. Given the several sources of contributions to symbol formation (i.e., referential object, symbolic vehicle, organisim's intention) (Werner & Kaplan, 1963), it would be desirable to control for the influence of each in further inquiry into representation.

There is some evidence (Reifel, 1981) to suggest that there is some conceptual fluidity (i.e., transformation in the child's mind) that may accompany the type of fluidity in formal depiction that has been presented above. All younger children (not just boys) include a greater proportion of seemingly extraneous material in their representations, material that does ont come from the given referent (i.e., from the story). Airplanes, flag poles, cars, and any number of other objects ended up in younger children's representations, indicating that the younger children's minds "flowed" from the given referent to any number of other referents. There may well be a concurrent fluidity, possibly related to syncretism (Piaget, 1962; Werner, 1957), in the content of younger children's thought that parallels the fluidity of symbolic representational structure that has been reported here.

The finding of sex differences for four-year-olds is interesting for a number of reasons. First of all, it appears that younger girls are not as clumsy with the materials as are the younger boys. They were better able to follow through on their constructions of a given representational configuration. This is consistent with findings of greater finger dexterity

on the part of girls (Maccoby & Jacklin, 1974), suggesting an earlier age difference than previously demonstrated. (It must be remembered, however, that younger girls' representations were significantly more difficult for a panel of judges to distinguish. Younger girls' representations, while not less structurally complex (Reifel & Greenfield, 1981), were more difficult for adults to distinguish than were boys' [Reifel, 1981].) Do girls have better manipulative skills with blocks, or are they less likely to take risks when it comes to forming complex configurations? If girls do not attempt to try daring combinations of blocks, they won't run the risk of having blocks fall. This intersection between the literatures on skilled manipulation and sex differences warrants further attention.

Representational activity is considered to be a critical aspect of cognitive development in the early childhood years (Piaget, 1962). It is important to take a closer look at the manner in which young children construct representations, looking for patterns in action with symbolic materials and for relationships between those patterns and language (Greenfield, 1978). It seems logical to explore the use of materials and the skills that contribute to representation at this stage. The data from this paper provide some perspective on some motoric aspects of early symbolic representation and on some ways that representation may reflect emerging mental capacities (i.e., pursuing goals). It may be that manipulative skill is one sub-routine (Lashley, 1951) of representation, a skill that must be developed before or while goal-setting is incorporated into the skilled activity of goal-directed (non-fluid) symbolic functioning.

References

Brown, A. L. Recognition, reconstruction, and recall of narrative sequences by preoperational children. Child Development, 1975, 46, 156-166.

Brown, A. L., & Smiley, S. S. Rating the importance of structural units of prose passages: A problem of metacognitive development. Child Development, 1977, 48, 1-9.

Bruner, J. S. Nature and uses of immaturity. American Psychologist, 1972 27, 1-28.

Gardner, H. Developmental psychology after Piaget: An approach in terms of symbolization. Human Development, 1979, 22, 73-88.

Greenfield, P. M. Structural parallels between language and action in development. In A. Lock (Ed.), Action, gesture, and language: The emergence of language. London: Academic Press, 1978.

Grimm, The Brothers. The complete Grimm's fairy tales. New York: Pantheon Books, 1972.

Langer, S. Philosophy in a new key. Cambridge, Mass.: Harvard University Press, 1942.

Lashley, K. S. The problem of serial order in behavior. In L. A. Jeffress (Ed.), Cerebral mechanisms in behavior: The Hixon symposium. New York: Wiley, 1951.

Maccoby, E. E., & Jacklin, C. N. The psychology of sex differences. Stanford: Stanford University Press, 1974.

Piaget, J. Play, dreams and imitation in childhood. New York: Norton, 1962.

Piaget, J. Structuralism. New York: Harper and Row, 1971.

Reifel, S. The development of symbolic representation: The case of building blocks. Paper read at the annual meeting of the American Educational

Research Association, Los Angeles, April, 1981. (ERIC Document Reproduction Service)

Reifel, S., & Greenfield, P. M. Structural development in a symbolic medium: The representational use of block constructions. In G. Forman (Ed.), Action and thought: From sensorimotor schemes to symbolic operations. New York: Academic Press, 1981.

Werner, H. Comparative psychology of mental development (Revised ed.). New York: International University Press, 1957.

Werner, H., & Kaplan, B. Symbol formation. New York: Wiley, 1963.

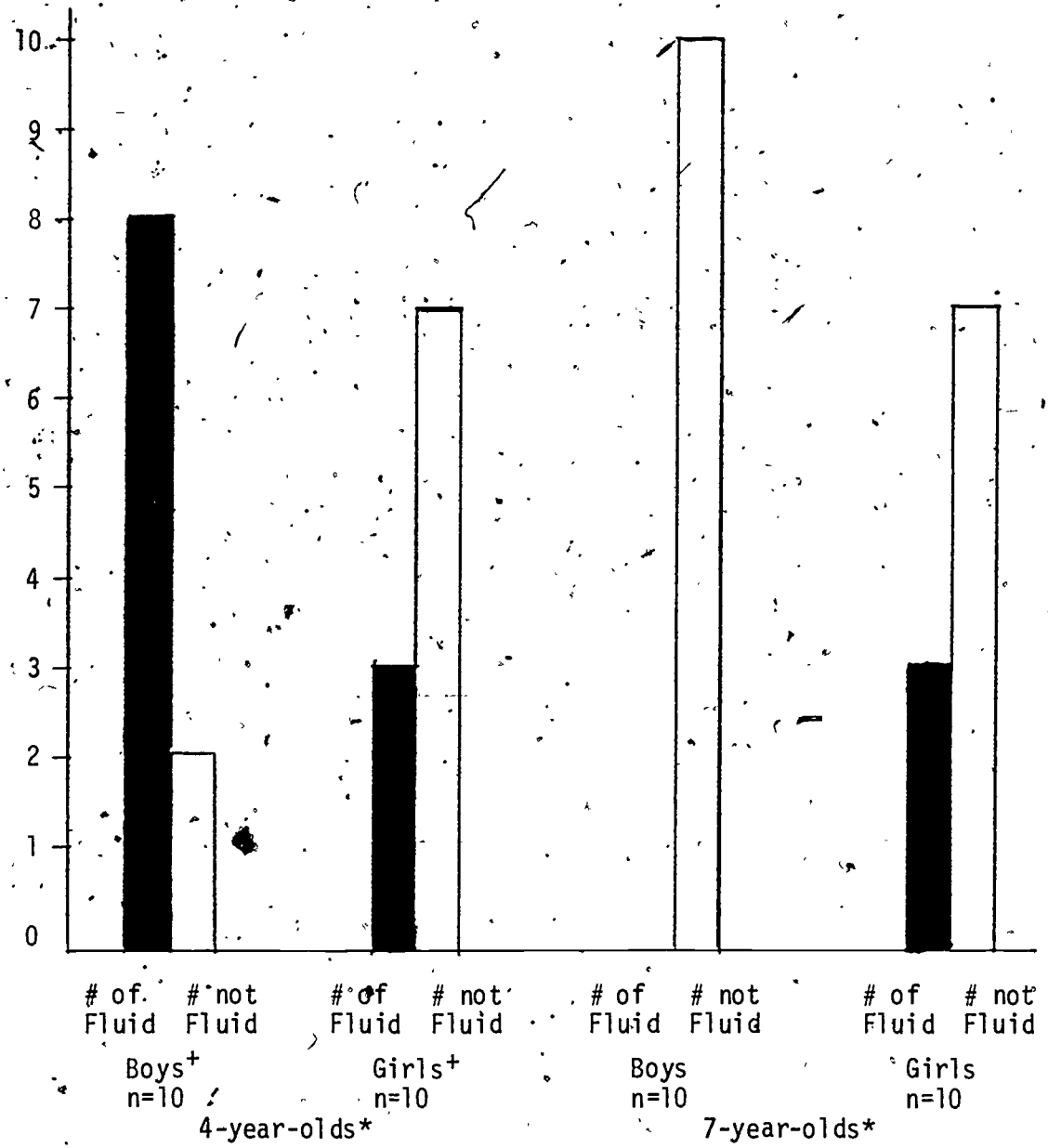

Table 1. Frequencies of fluid and non-fluid representational constructions.

Cases of Fluid Construction	Source of Fluidity: Blocks fell	Source of Fluidity: Child moved Blocks
4-year-old Boys n = 8	8	0
4-year-old Girls n = 3	2	1
7-year-old Boys n = 0	0	0
7-year-old Girls n = 3	1	2
Total	11	3

Table 2. Frequencies for sources of fluidity.

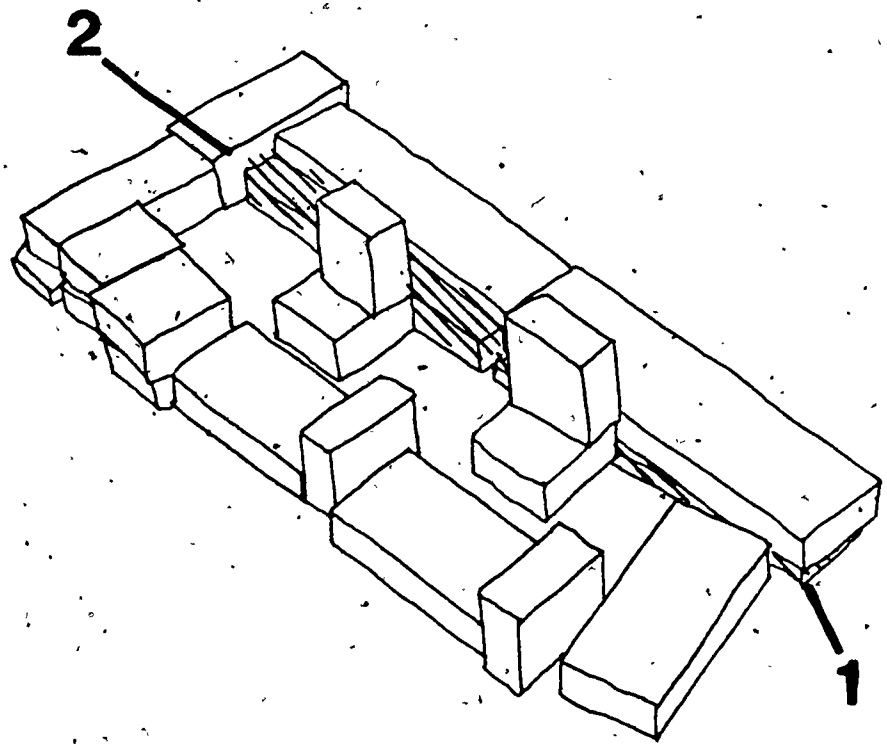

Figure 1. Non-fluid representation of house with two chairs inside.

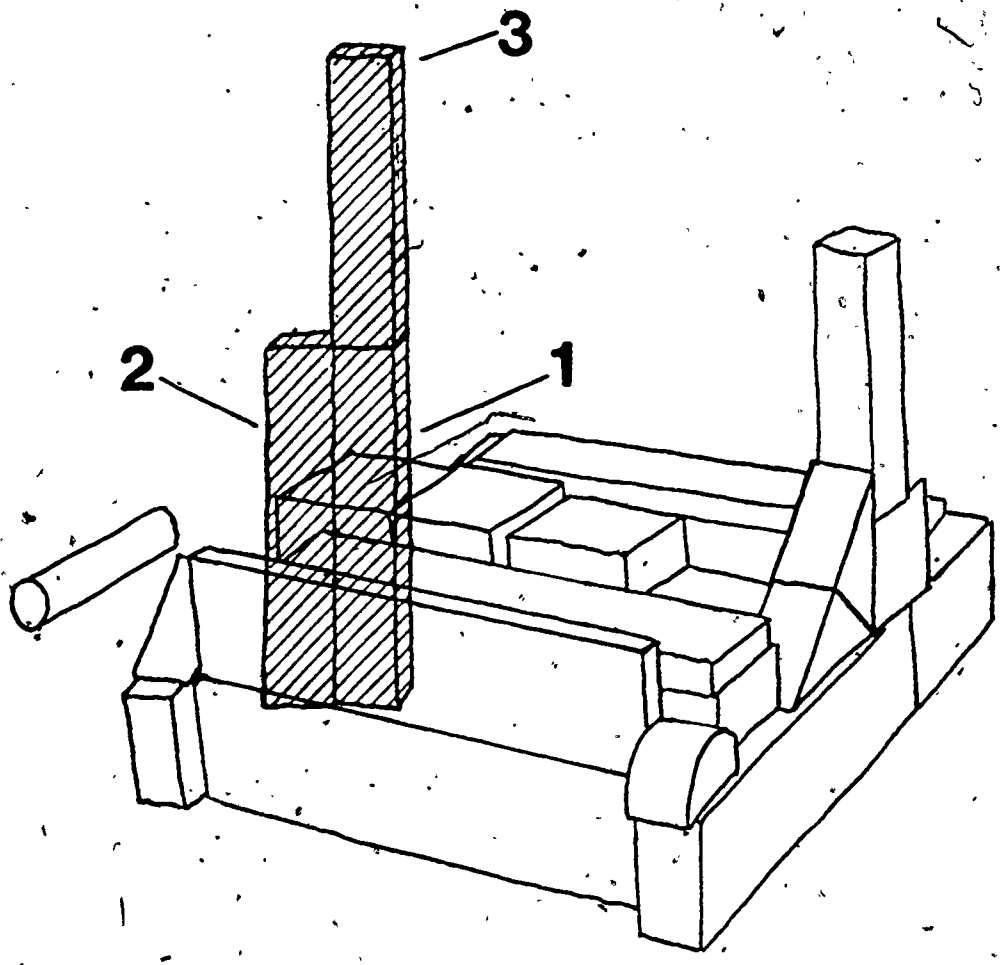

Figure 2. Fluid representation ending as a house.

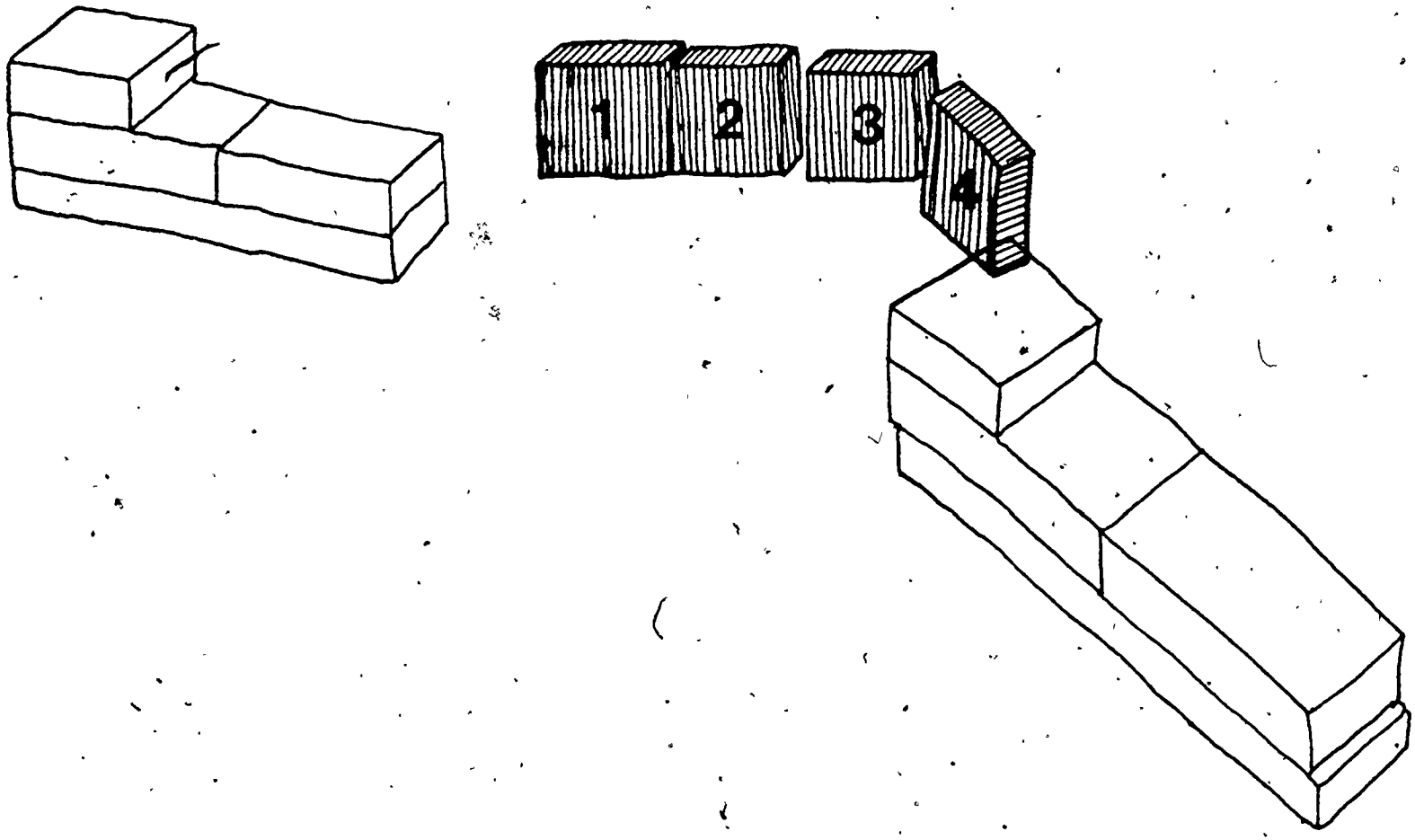

Figure 3. Fluid representation ending as two beds.

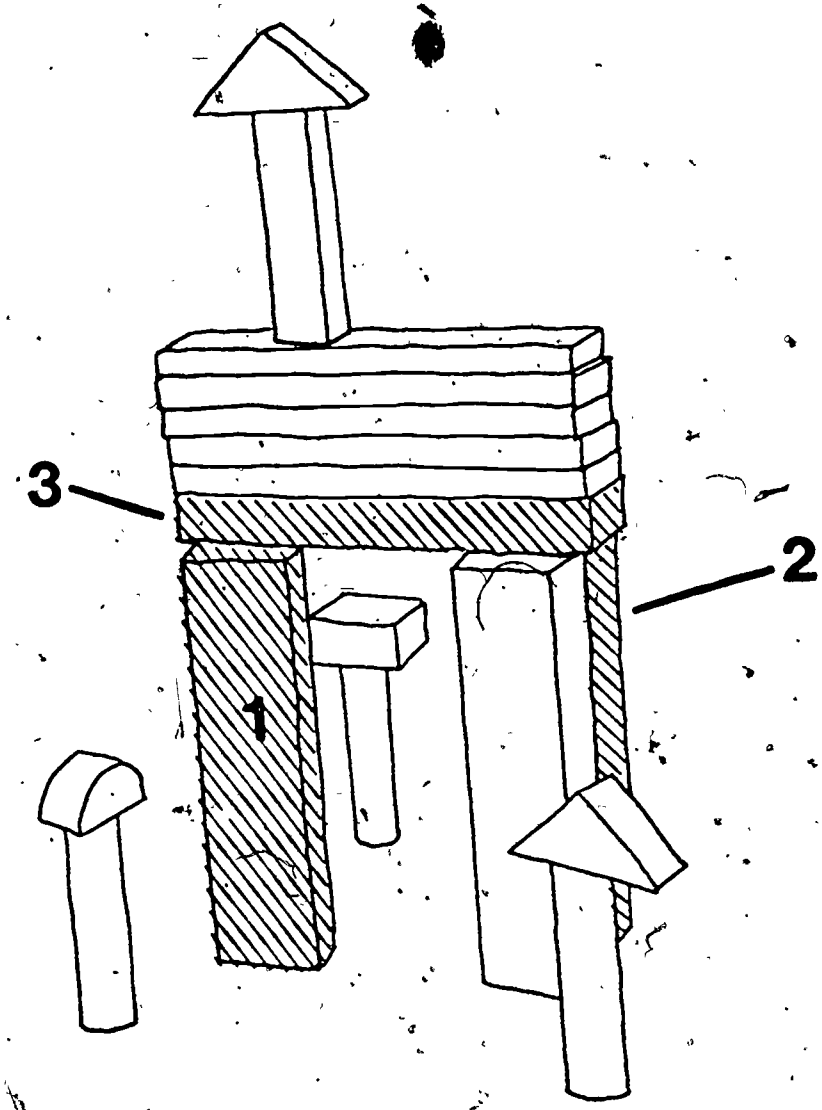

Figure 4. Non-fluid representation of a house surrounded by flowers.

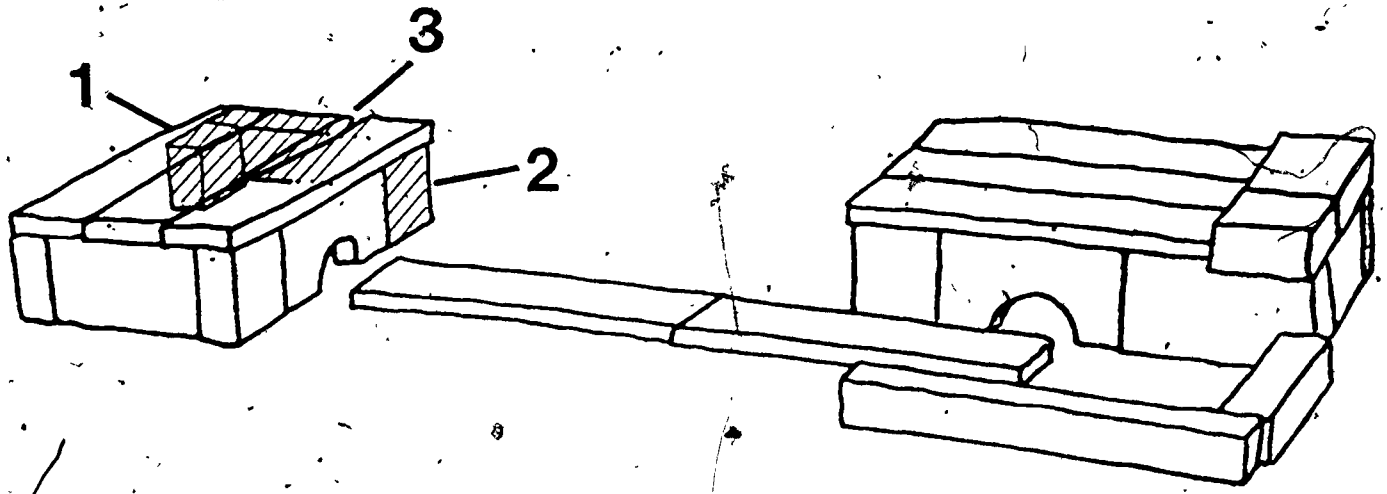

Figure 5. Non-fluid representation of two houses connected by a path.